DECISION RECORD

Environmental Assessment No. NM-060-00-089
Allotment 61005,65015, and 65017

Decision: It is my decision to authorize the issuance of a ten year grazing permit/lease on public lands on the three James P. Southard Allotments. The lease will allow 13 Animal Units yearlong at 100 % Federal Range for allotment #61005, 1 Animal Unit at 100% Federal Range for alltoment # 65015, and 5 Animal Units at 100% Federal Range on allotment #65017. Anycommentsmade to this proposed treatment were considered and any necessary changes have been incorporated into the environmental assessment.

In accordance with 43 CFR 4160, a period of 15 days is allowed after the receipt of this proposed decision to protest it to the Authorized Officer in person or in writing. Points of protest should be specific. In the absence of a protest, this proposed decision will become the final decision of the Authorized Officer without further notice.

In accordance with 43 CFR 4.470, a period of 30 days is allowed following the date of the final decision to file an appeal and petition for a stay of the decision for the purpose of a hearing before an Administrative Law Judge. The specific points being appealed should be clearly and concisely stated. Appeals can be filed at the following address:

Field Office Manager
Bureau of Land Management
Roswell Field Office
2909 West Second Street
Roswell, New Mexico

signed by T. R. Kreager 8/14/00
Associate Field Office Manager - Resources Date

ENVIRONMENTAL ASSESSMENT
for
GRAZING AUTHORIZATION

ALLOTMENT 61005, SECTION 15,

65015, SECTION 03,

AND

65017, SECTION 15

EA-NM-060-00-089

AUGUST, 2000

U.S. Department of the Interior
Bureau of Land Management
Roswell Field Office
Roswell, New Mexico

I. Introduction

When authorizing livestock grazing on public range, the Bureau of Land Management (BLM) has historically relied on a land use plan and environmental impact statement to comply with the National Environmental Policy Act (NEPA). A recent decision by the Interior Board of Land Appeals, howevbr, affirmed that the BLM must conduct a site-specific NEPA analysis before issuing a permit or lease to authorize livestock grazing. This environmental assessment fulfills the NEPA requirement by providing the necessary site-specific analysis of the effects of issuing a new grazing lease on allotment #61005, and a permit for allotments 65015 and 65017.

The scope of this document is limited to the effects of issuing a new grazing lease on allotment # 61005, and a new permits for allotment # 65015 and 65017. Over time, the need could arise for subsequent management activities which relate to grazing authorizations. These future management actions related to livestock grazing would be addressed in project-specific NEPA documents as they are proposed.

A. Purpose and Need for the Proposed Action

The purpose of issuing a new grazing lease would be to authorize livestock grazing on public lands on allotment #61005, 65015, and 65017 The permit and lease would specify the types and levels of use authorized, and the terms and conditions of the authorization pursuant to 43 CFR §§4130.3, 4130.3-1, 4130.3-2 and 4180.1.

B. Conformance with Land Use Planning

Upon review of the Roswell Resource Management Plan/Environmental Impact Statement (Bureau of Land Management 1997), the proposed action was found to conform with the Record of Decision as required by 43 CFR 1610.5-5.

C. Relationships to Statutes, Regulations, or Other Plans

The proposed action is consistent with the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1700 et seq.); the Taylor Grazing Act of 1934 (43 U.S.C. 315 et seq.), as amended; the Clean Water Act (33 U.S.C. 1251 et seq.), as amended; the Endangered Species Act (16 U.S.C. 1535 et seq.) as amended; the Federal Rangelands Improvement Act of 1978 (43 U.S.C. 1901 et seq.); Executive Order 11988, Floodplain Management and Executive Order 11990, Protection of Wetlands.

Proposed Action and Alternatives

A. Proposed Action:

The proposed action is to authorize James P. Southard grazing leases on:

Allotment 61005 for 13 cattle yearlong at 100% Federal Range for 156 Animal Unit Months active use;

Allotment 65015 for 1 cow yearlong at 100% Federal Range for 12 Animal Unit Months active use;

Allotment 65017 for 5 cattle yearlong at 100% Federal Range for 60 Animal Unit Months (AUM's) of which 4 cows yearlong active use for 48 AUM's and one cow yearlong suspended use for 12 AUM's.

B. No Lease authorization alternative:

This alternative would not issue a new grazing lease. There would be no livestock grazing authorized on public land within allotments # 61005, 65015, and 65017. The No Grazing alternative was considered, but not chosen in the Rangeland Reform Environmental Impact Statement (EIS) Record of Decision (ROD) (p. 28). The elimination of grazing in the Roswell Field Office Area was considered but eliminated by the Roswell RMP/ROD (pp. ROD-2).

III. Affected Environment

A. General Setting

Allotments 65015 and 65017 are located in northeastern Chaves county, while #61005 is located in eastern Roosevelt County; all are approximately 10 miles southeast of Kenna, New Mexico.

Allotment 65015 consists of one pasture with approximately 160 acres of federal land, 20 acres of state leased land and approximately 1,540 acres of private land. The allotment is watered via a pipeline from a windmill located on private land.

Allotment 65017 has two pastures with approximately 340 acres of federal land, 2,080 acres of state leased land, and approximately 2,240 acres of private land. The allotment consists of two pastures with each pasture receiving some rest during the growing season. During drought conditions, cattle are scattered in both pastures to prevent degradation of one particular pasture. For forage allocation, only the Public land is accounted for under this section 15 lease.

Allotment 61005 consists of several pastures with the federal land occurring within two pastures. There is approximately 960 acres of federal land, 640 acres of state land and approximately 4,660 acres of private land. During normal precipitation patterns a rest rotations is implemented, but during drought conditions cattle are scattered in all pastures to prevent degradation of one particular pasture.

Allotments 65017 and 61005 lie outside of the Roswell Grazing District boundary established subsequent to the Taylor Grazing Act (TGA). Grazing authorization on Public Lands outside of the Grazing District boundary is governed by section 15 of the TGA and are commonly referred to as section 15 lands. Overall livestock numbers for these allotments are not controlled under this section 15 lease. The amount of forage produced on Public land is the determining factor on the number of authorized livestock. Allotment 65015 is within the grazing district boundary where the BLM normally controls the number of livestock; but due to the limited amount of public land, it is categorized as a section 15 allotment.

The following resources or values are not present or would not be affected: Prime/Unique Farmland, Areas of Critical Environmental Concern, Floodplains, Minority/Low Income Populations, Wild and Scenic Rivers, Hazardous/Solid Wastes, Wetlands/Riparian Zones, Noxious Weeds and Native American Religious Concerns. Cultural inventory surveys would continue to be required for public actions involving surface disturbing activities.

B. Affected Resources

1. Soils: The primary soil units on these allotments are the Brownfield fine sand, Trivoli fine sand, Roswell-Jalmar fine sands, hilly and the Arvana loamy fine sand.

Trivoli fine sand

This soil consist of of deep loose sands. The sand is noncalcareous. The permeability of this soil is high, water capacity is low, runoff is low, while the soil blowing hazard is very high.

Brownfield fine sand

The surface layer is 18 to 23 inches thick and ranges from fine sand to loamy fine sand. The subsoil is a a sandy clay loam ranging in thickness from 3 to 5 feet. Permeability of the Brownfield soil is rapid, water capacity is low, runoff is slow, while the soil blowing hazard is very high.

Roswell-Jaimar fine sands, hilly

This soil type is hummocky sand dunes, and the Jalmar soil is in depressional areas and interdunal areas. It is deep and excessively drained. Permeability is rapid an water capacity is low, while the hazard for wind erosion is high.

Arvana loamy fine sand

The surface layer consists of 10 inches of reddish brown fine sand, and it has weak granular structure. In areas that are used for range, runoff is slight, but in cultivated fields runoff can be likely to cause erosion. This soil has little resistance to wind erosion because of its sandy surface layer.

2. Vegetation:

The primary ecological (range) sites on the public lands within these allotments are Deep Sand HP-3 and Sandy Plains HP-3. Key vegetation is shinnery oak with bluestem and dropseed grasses. The Deep Sand community is a unique ecological area dominated by tall and mid-grasses. In some areas, the shinnery oak community has shifted from a dominant sand bluestem/little bluestem/hairy grama grassland with varying amounts of shinnery oak, sand sage and yucca to a community dominated by sand dropseed, red and purple three-awn and hairy grama, with increasing annual forbs, shinnery oak, mesquite, sand sage and yucca. Currently, the Roswell Field Office (RFO) has limited vegetative data for these allotments because of the

allotment categorization. A vegetation inventory was completed in 1991. Data at that time placed the public lands within the late ecological rating at 56%. Recent vegetative monitoring was completed in March of 2000 and is attached for your review.

The RMP/EIS established resource objectives for the Shinnery Oak Dune community. The vegetative cover by percent composition objectives for the SOD community are grasses 50 - 70 %, forbs 10 - 15 %, shrubs & trees 25 - 40 %. The ground cover objectives for this community are: bare ground 5 - 20 %, litter 25 - 70 %, small & large rock 0 - 1 %, grass & forbs 16 - 40 % and shrubs & trees 3-17%.

No permanent monitoring studies were established on these allotments because of the small acreage of public land and its placement in the custodial ("C") category. A recent field review and monitoring data of the public lands on this allotment indicated the existing ground cover to be in good condition.

The grass component is dominated by bluestems, threeawns, dropseeds, lovegrasses, black and hairy grama and a lesser amount of sand paspalum and fall witchgrass; the shrub component is dominated by shinnery oak, sand sage, yucca and some mesquite; the forb component is comprised of a variety of both annual and perennial species.

The current vegetative resources on these allotments appear to be stable and the rangeland trend is static. The data used for this assessment is available at the Roswell Field Office.

3. Wildlife:

Game species occurring within the area include mule deer, pronghorn antelope, mourning dove, and scaled quail. Raptors that utilize the area on a more seasonal basis include the Swainson's, red-tailed, and ferruginous hawks, American kestrel, and great-horned owl. Numerous passerine birds utilize the grassland areas due to the variety of grasses, forbs, and shrubs. The most common include the western meadowlark, mockingbird, horned lark, killdeer, loggerhead shrike, and vesper sparrow.

The warm prairie environment supports a large number of reptile species compared to higher elevations. The more common reptiles include the shorthorned lizard, lesser earless lizard, eastern fence lizard, coachwhip, bullsnake, prairie rattlesnake, and western rattlesnake.

A general description of wildlife occupying or potentially utilizing the proposed action area and associated Habitat Management Areas refer to the Affected Environment Section (p. 3-62 to 3-71) of the Draft Roswell RMP/ElS (9/1994).

4. Threatened and Endangered Species:

There are no threatened or endangered species populations or critical habitat areas within these three allotments. However, there are several Federal Candidate and State listed species that may occupy or utilize the area. These include the swift fox, mountain plover, lesser prairie chicken, sand dune lizard and the black-tailed prairie dog. For a detailed description of the range, habitats,

and potential threats to the swift fox refer to the Biological Opinion (AP1 1-38) in the RMP.

Special Status Species

Sand Dune Lizard (State Threatened)

The State Threatened sand dune lizard only occurs in the southeastern corner of New Mexico and the western edges of Texas. Within that range its habitat is restricted to active sand dunes and their peripheries (Degenhardt and Jones

1972). Shinnery oak is the dominant plant species that surrounds the top edge of the active snad dune, with a small composition of grasses inside the blowout.

During 1991 a study was begun to examine the effects of the removal of shinnery oak on lizard habitat. Through five years of research it was demonstrated that there were 70-94% fewer lizards in treated pastures as compared to non-treated pastures. As a result, the use of herbicides within suitable sand dune lizard habitat (blowouts) will be avoided.

There are scattered shinnery oak dune blowouts or dune complexes throughout the area that may provide habitat for the sand dune lizard.

Mountain Plover (Federally Proposed as Threatene!Q

The mountain plover has been petitioned to be listed as a federally listed threatened species under the Endangered Species Act. Until a determination is made by the USFWS, actions occurring within this species range and habitat must be analyzed and treated as a listed species.

The mountain plover is associated with shortgrass and shrub-steppe landscapes throughout its breeding and wintering range. Historically, on the breeding range it occurred on nearly denuded prairie dog towns (Knowles et al. 1982, olson-Edge and Edge 1987) and in areas of major bison concentration. All of the endemic grassland birds evolved within a grassland mosaic of lightly, moderately, and heavily grazed areas, and mountain plovers are considered to be strongly associated with sites of heaviest grazing pressure, to the point of excessive surface disturbance (Knopf and Miller 1994, Knopf 1996b). Short vegetation, bare ground, and a flat topography are now recognized as habitat-defining characteristics at both breeding and wintering locales. Most mountain plovers breed in Colorado and Montana; breeding also occurs in Wyoming, New Mexico, Arizona, Nebraska, Utah, Kansas, Oklahoma and Texas.

Surveys: Information was taken from the Federal Register Notice and the Roswell RMP. Statewide surveys have been conducted as well as area surveys by S. Williams. No known breeding populations or wintering locales have been found. Specific surveys for this action were not conducted since recent area surveys in May and June of 1998 were completed.

Lesser Prairie Chicken (Federal Candidatq)

Several years ago a petition was filed with the U. S. Fish and Wildlife Service (FWS) to list the

prairie chicken as threatened. On June 1, 1998 the FWS announced a finding for the petition. After review of all available scientific and commercial information, the Service finds that listing this species is warranted but precluded by other higher priority actions to amend the Lists of Endangered and

Threatened Wildlife and Plants. The lesser prairie chicken has been added to the Service's candidate species list.

In southeastern New Mexico, lesser prairie chickens exist in the shrubdominated High Plains Bluestern Subtype by using mixed stands of tall grass and shinnery oak.

Male prairie chickens visit or establish booming grounds (leks) from early March to late May, with the peak booming activity occurring around the middle of April. Booming grounds can be found in mesquite shortgrass, shinnery oak grasslands, shinnery oak dunes, abandoned oil/gas pads, pipelines and roads. The basic requirement for lek sites is visibility of the immediate surroundings (shortgrass and topography)..

Female prairie chickens prefer range in excellent condition for nesting. In areas of shinnery oak, nesting studies (Copelin 1963, Riley 1978) indicate that these birds prefer shinnery oak rangeland habitat dominated by mid and tall grass species. Wisdom (1980) demonstrated that nesting success was enhanced by the presence of tall, wide clumps of sand bluestem, which are found in a few near-climax areas in the shinnery oak-grassland, while areas devoid of sand bluestern were not highly conducive to nesting success. In areas where sand bluestern is scarce, little bluestem apparently serves as an acceptable substitute Merchant (1982). Riley et al. (1992) found that most successful nests occurred where basal composition of sand bluestern was greater and the height of vegetation above successful nests averaged 67 cm, while height of vegetation above unsuccessful nests averaged 35 cm.

Copelin (1963) found that the most successful nests were placed between clumps of grass residue left from the previous year's growth that provided overhead cover.

Brooding areas are often within habitats which are in lower seral stages usually having a high proportion of bare ground and annual forbs (Riley et al. 1992, Jones 1963).

Food requirements vary among the seasons. Prairie chickens rely heavily (97%) on forbs and other green plant material during the spring and invertebrates in the summer. The early fall diets consist of invertebrates and green plant material, while winter diets consist of mast from shinnery oak.

Above is a general description of prairie chicken habitat requirements. As with most wildlife species, especially upland game birds, precipitation plays a large role in population fluctuations and habitat conditions. Precipitation patterns have fluctuated drastically for the last twenty years. During the middle eighties precipitation was above normal and chicken populations responded very well. For

the exception of two years, precipitation has been well below normal during the 1990's.

Population Monitoring Data

The Roswell Field Office has actively monitored prairie chicken booming grounds, population trends and habitat since the early seventies within the Caprock Wildlife Habitat Area. Historically in New Mexico, the LPC occupied most of the eastern plains. However, numbers and occupied range of the species are much reduced since pre-settlement times; apparently in response to prolonged heavy grazing and brush control in combination with the great drouths of the 1930's and 1950's. It has been reported that currently the LPC occupies approximately one half their original range in New Mexico.

Prairie chickens are still known to occur within all three of the allotments that Mr. Southard operates (see attached lek surveys). Allotment 65015 has one known booming ground. This booming ground has not been active for several years but there are active booming grounds adjacent to this small parcel of public land. Allotment 65017 has one known booming ground with a fairly stable activity level. Allotment 61005 has not been monitored by this office but after visiting with the permittee, there are several birds utilizing the area, and survey efforts will begin. Adjacent to allotment 61005 to the east are several state owned prairie chicken management areas, that have been surveyed with several booming grounds being located.

5. Livestock Management:

The allotment is operated as a cow/calf operation. The expiring grazing lease is for 4 cattle yearlong at 100% Federal Range for 48 Animal Unit Months (AUM's)on allotment 65017, 13 cattle yearlong at 100% Federal Range for 156 Animal Unit Months on allotment 61005, and a grazing permit for 1 Animal Unit at 100% Federal Range for 12 Animal Unit Months on allotment # 65015. Actual livestock numbers on the entire ranch are not controlled by the BLM as explained in the General Setting portion of the Affected Environment section above.

Livestock are rotated through the pastures when conditions are favorable. During times of drought, livestock numbers are lowered and scattered throughout all pastures.

6. Visual Resources:

The allotments are located within a Class IV Visual Resource Management area. This means that contrasts may attract attention and be a dominant feature in the landscape in terms of scale. However, the changes should repeat the basic elements of the landscape.

7. Water Quality:

No perennial surface water is found on the Public Lands within these three allotments.

8. Air Quality:

Air quality in the region is generally good. The allotments are in a Class 11 area for the Prevention of Significant Deterioration of air quality as defined in the public Clean Air Act. Class 11 areas allow a moderate amount of air quality degradation.

9. Recreation:

Recreation opportunities are very limited in this grazing allotments because the public has limited legal/physical access to public lands.

Off Highway Vehicle designation for public lands within this allotment are classified as "Limited" to existing roads and trails.

10. Cave/Karst:

A complete significant cave or karst inventory has not been completed for the public lands located in these three grazing allotments. Presently, no known significant caves or karst features have been identified. If at a later date, a significant cave or karst feature is located on public lands within these allotments, that cave or feature may be fenced to exclude livestock grazing and Off Highway Vehicle Use. A separate environmental analysis would be prepared to construct this exclosure fence.

These allotments are located within a designated area of Low Karst or Cave Potential.

IV. Environmental Impacts

A. Impacts of the Proposed Action

1. Soils: Livestock remove the cover of standing vegetation and litter, and compact the soil by trampling (Stoddart et al. 1975). These effects can lead to reduced infiltration rates and increased runoff. Reduced vegetative cover and increased runoff can result in higher erosion rates and soil losses, making it more difficult to produce forage and to protect the soil from further erosion. These adverse effects can be greatly reduced by maintaining an adequate vegetative cover on the soil (Moore et al. 1979). Rangeland vegetation inventory data from the allotment indicates that, at the level of grazing identified in the proposed action, the percent bare ground and rock found on the allotment fall within the parameters established by the RMP/EIS for this vegetative community. Proper utilization levels and grazing distribution patterns are expected to retain sufficient vegetative cover on the allotment, this will maintain the stability of the soils. Soil compaction and excessive vegetative use will occur at small, localized areas such as bedding areas, watering sites, and along trails. Positive affects from the proposed action may include acceleration of the nutrient cycling process and chipping of the soil crust by hoof action may stimulate seedling growth and water infiltration.

2. Vegetation: Vegetation will continue to be grazed and trampled by domestic livestock as well as other herbivores. The area has been grazed by livestock since the early part of the 1900's, if not longer. Ecological condition and trend is expected to remain stable as it has in the past. Rangeland vegetation inventory data indicates that there is an adequate amount of forage for the proposed number of livestock and for wildlife.

3. Wildlife: Domestic livestock will continue to utilize vegetative resources needed for a variety of wildlife species for life history functions within these allotments. The magnitude of livestock

grazing impacts on wildlife is dependent upon the species of wildlife being considered, and its habitat needs. In general, livestock stocking rate adjustments have been made in the past to minimize the direct competition for those resources needed by a variety of wildlife species. Cover habitat for wildlife will remain the same as it has been or the existing situation. Maintenance and operation of existing waterings will continue to provide dependable water sources for wildlife, as well as livestock.

4. T&E species: Under the proposed action there would be no affect to Federal threatened and endangered species since there are no known T/E occurrences within this allotment.

Special Status Species

Under the proposed action, lesser prairie chicken habitat would continue to be maintained. Vegetative composition and utilization levels on key grass species are such that the allotment provides most if not all of the habitat requirements needed for lesser prairie chickens. An indication of this analysis is the continual maintenance of lesser prairie chickens during the poor and droughty conditions of the 1970's and 1990's.

5 Livestock Management: Livestock would continue to be grazed under the same management system and the same numbers as authorized under the expiring lease and permits. No adverse impacts are anticipated under the proposed action.

6. Visual Resources: The continued grazing of livestock would not affect the form or color of the landscape. The primary appearance of the vegetation within the allotment will remain the same.

7. Water Quality: No impacts to water quality is anticipated. Livestock would be dispersed over the allotment, and the soil would filter potential contaminants.

8. Air Quality: Dust levels under the proposed action would be slightly higher than under the no grazing alternative due to allotment management activities. The levels would still be within the limits allowed in a Class 11 area for the Prevention of Significant Deterioration of air quality.

9. Recreation: Grazing would have little or no affect on the recreational opportunities, since the recreating public has no legal or physical access to these parcels of public land. Recreation activities that could occur within this grazing allotment are limited or non-existent due to land status patterns. 10. Caves/Karst: No known significant caves or karst features are known to exist on the public lands located within this allotment. Grazing would not affect the karst resources.

B. Impacts of the No Livestock Grazing Alternative.

1. Soils: . Soil compaction would be reduced on the allotments around old trails and bedding grounds, there would be a small reduction in soil loss on the allotment.

2. Vegetation: It is expected that the number of plant species found within the allotments will remain the same, however, there would be small changes in the relative percentages of these species. Vegetation will continue to be utilized by wildlife. There would be an increase in the

amount of standing vegetation.

3. Wildlife: Wildlife would have no competition with livestock for forage and cover.

4. T&E Species: There would be no impacts to threatened or endangered species or habitat.

Special Status species habitat would be improved.

5. Livestock management: The forage from public land would be unavailable for use by the lessee/permittee . This would have an adverse economic impact to the livestock operation. If the No Grazing alternative is selected, the owner of the livestock would be responsible for ensuring that livestock do not enter Public Land [43 CFR 4140.1 (b)(1)]. The checkerboard land status on the allotment makes it economically unfeasible to fence out the public land and use only the private land.
6. Visual Resources: There would be no change in the visual resources.

7. Water Quality: There could be slight improvement in water quality due to the potential lack of contaminants.

8. Air Quality: There would be a slightly less dust under this under this alternative versus the proposed alternative, but this would be negligible when considering all sources of dust.

9. Recreation: Impacts would be the same as the proposed action.

10. **Caves/Karst: Impacts would be the same as the proposed action.**

V. Cumulative Impacts

Cumulative impacts of the grazing and no grazing alternatives were considered in Chapter 4 of Rangeland Reform '94 Draft Environmental Impact Statement and in Chapter 4 of the Roswell Resource Area Proposed RMP/EIS. The no livestock grazing alternative was not selected in either document.
On the allotment specific level, there will be no cumulatively significant impacts from the proposed action /alternatives or from the no grazing alternative.

VI. Residual Impacts

The area has been grazed by livestock since the early part of the 1900's if not longer. Recent vegetative monitoring studies have shown that grazing , at the current permitted numbers of animals, is sustainable. If the mitigation measures are enacted, then there would be no residual impacts to the proposed action

VII. Mitigating Measures And/Or Permit/Lease Conditions

Vegetation monitoring studies will continue to be conducted and the permitted numbers of livestock will be adjusted if necessary. If new information surfaces that livestock grazing is

negatively impacting other resources, action will be taken at that time to mitigate those impacts.

Literature Cited

Copelin,F.F.1963. The lesser prairie chicken in Oklahoma. Technical Bulletin 6. Oklahoma City: Oklahoma Wildlife Conservation Department.58 pp.

Davis,C.A.;Riley,T.Z.;Smith,R.A.;Suminski,H.R.;Wisdom,M.J. 1979. Habitat evaluation of lesser prairie chickens in eastern Chaves County, New Mexico. Final report to Bureau of Land Management, Roswell. Contract YA-512-CT6-61. Las Cruces: New Mexico State University, Department of Fishery and Wildlife Sciences. 141 pp.

Degenhardt, W.G.;Jones,K.L.1972. A new sagebrush lizard, Scelorporus graciosus, from New Mexico and Texas. Herpetologica 28.

Jones,R.E. 1963. Identification and analysis of lesser and greater chicken habitat. Journal of Wildlife Management 27: 757-778.

Merchant,S.S. 1982. Habitat-use, reproductive success, and survival of female lesser prairie chickens in two years of contrasting weather. M.Sc. thesis, New Mexico State Univ., Las Cruces.

Riley,T.Z.1978. Nesting and brood rearing habitat of lesser prairie chickens in southern New Mexico. Thesis NMSU. Las Cruces, N.M., 62 pp.

Riley,T.Z., C.A.Davis, M.Ortiz, and M.J.Wisdom. 1992. Vegetative characteristics of successful and unsuccessful nests of Lesser Prairie Chickens. J. Wildl. Manage. 56: 383-387.

Wisdom,M.J.1980.Nesting habitat of lesser prairie chickens in eastern New Mexico. M.Sc. Thesis, Univ. New Mexico,Las Cruces.